Volume 15 November, 1929 *Number 11*

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Lubrication

A Technical Publication Devoted to the Selection and Use of Lubricants

THIS ISSUE

Lubrication of Printing Machinery

PUBLISHED MONTHLY BY
THE TEXAS COMPANY
TEXACO PETROLEUM PRODUCTS

The Lubrication *of* Printing Machinery

THE earlier types of printing machinery were of cumbersome construction and slow in operation. As a result, press operators gave little consideration to lubrication.

Today, in order to meet the tremendously increased demands of production, the manufacturers have increased the speed of printing machinery by refining the design and construction of all the moving parts and wearing elements.

It is fitting that lubrication should receive due attention in connection with these changes. Unselfish cooperation between the artisan, the engineer and the lubrication specialist will lead to even greater improvement in machine design and greater economy in operation, provided the machine itself is *effectively protected* by lubrication.

It is the good fortune of The Texas Company to be able to offer the utmost cooperation to the printing industry in this regard. The accompanying article is an indication of this fact. It explains what the manufacturers of printing machinery are doing toward improving lubrication and the types of lubricating equipment which have received the most attention.

Texaco Lubricating Engineering Service is available to you in connection with any problem pertaining to the lubrication of printing machinery.

THE TEXAS COMPANY

Texaco Petroleum Products

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LUBRICATION

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Published Monthly by
The Texas Company, 17 Battery Place, New York City
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Vol. XV November, 1929 No. 11

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Lubrication of Printing Machinery

THE art of modern printing is a most interesting example of the inventive genius of man in the development of means for improving education, the exchange of ideas and the distribution of news.

From the time of Caxton in the fifteenth century, printing has involved the use of machinery. To be sure, the earlier types of printing presses were crude and of limited production,—a marked contrast to the modern superspeed newspress. Yet, the crude presses of these earlier days served their purpose, in view of the status and limited class of readers.

Today, however, the printing press is the very basis of our modern civilization in that, to learn, one must read. To meet this intensive requirement, the development in printing machinery has been marked over the past fifty years, until today one has but to visit a modern pressroom or bindery to realize the intensive efforts which have been put into design and construction of some of the most intricate mechanisms in the field of mechanical engineering.

There is, however, another most essential factor in printing machinery operation, for continued operation of such accurately built equipment can only be assured by effective reduction in friction between the wearing elements. It is for this reason that lubrication must be given most careful consideration.

PRESSROOM MACHINERY

The machinery in the modern pressroom will involve presses of the platen, flat bed, and web types. In all, the primary purpose is similar; i.e., the impression of printed characters, etc., from a plate or form to a single or continuous sheet of paper. But there is marked difference in the manner by which this is brought about.

The platen press, for example, is a relatively simple piece of mechanism, as compared with the modern large rotary newspaper press. In this regard, it can be appreciated that the type of work which is to be done will influence the construction of the press.

In the job press-room where the printing of cards, envelopes, circulars, and other short-run material of usually less than 20,000 impressions constitutes the bulk of the business, the platen press is frequently the most economical machine to use, due to the simplicity of operation, the rapidity with which the form can be made ready and registered, the facility with which the press can be changed from one job to another, and the fact that one man can take care of from one to three presses. In addition, the platen press requires but little power and floor space and gives excellent register or alignment of printed matter.

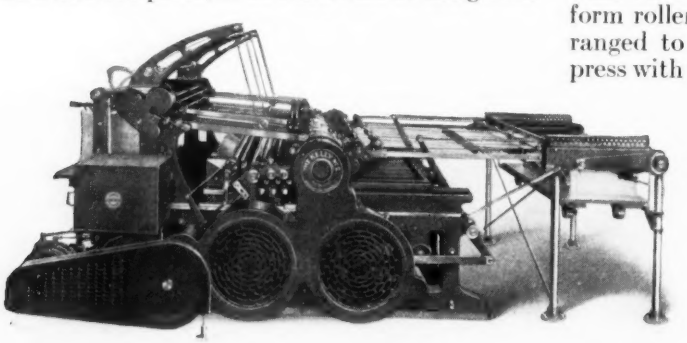
On the other hand, where publications such as newspapers, magazines, etc., are involved, cylinder presses of the flat bed and web types are best adapted. Speed of production is one of the most important factors in this phase of the printing industry, so the rotary press with its ability to turn out thousands of impressions per hour has become actually a national necessity.

PRESS CONSTRUCTION

The Cylinder Type

A cylinder press is a printing machine wherein the paper receives its impression by passing over one or more impression cylinders in contact with either a flat bed or similar

cylinder which carries the plates of typographical matter. It is possible to print in either one or two colors on one side of the sheet on a flat bed press, or to otherwise so design the press as to print in one or two colors on both sides of the paper in one operation.



Courtesy of American Type Founders Company.

Fig. 1—Side view of a flat bed press, showing the details of construction, and especially the means provided for guarding the driving elements.

Flat Bed Press Operation

In the modern flat bed press, the paper is fed to the press guides in individual sheets, and the plates or type matter lie perfectly flat on the press bed, being securely locked in place. The paper is carried by a suitable device to the impression cylinder which in turning passes each sheet through in contact with the type bed, to bring about the impression.

The type-bed is fitted with two or four sets of steel anti-friction rollers which travel on steel tracks installed the full length of the press. In operation the bed travels backward and forward periodically, being actuated by a suitable crank mechanism driven by gears from the main drive of the machine. As the direction of motion of the type-bed is changed the impression cylinder is automatically lifted from contact by means of suitable cam mechanisms, in order to permit it to move continuously in one direction. Two revolutions of the cylinder are made to one backward and forward movement of the bed.

The Inking Device

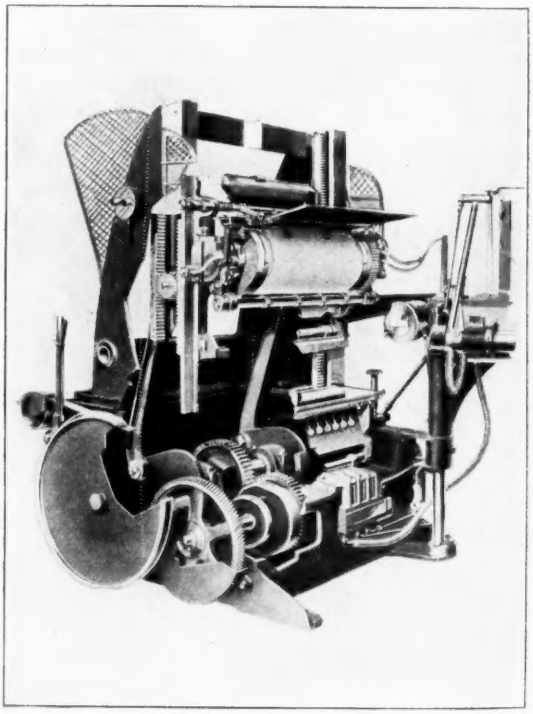
This consists of a fountain, several distributing rollers, an ink plate moving back and forth with the type bed, and several form rollers. Elastic composition and hard metal surfaces alternate, the fountain, ink plate and lateral distributors being metal, the ink rollers, form, ductor and regular distributors consisting chiefly of gelatin, but sometimes of rubber composition.

There are two sets of inking devices in a flat bed press designed for two-color work or the printing of both sides of the paper in one color at one operation.

The ink is rather tacky, and in order to insure as perfect and uniform a distribution as possible, the several distribution rollers through which the ink is passed before being applied by form rollers to the type plates, are usually arranged to move from side to side across the press with respect to each other during rotation. Their actual distance of travel is only a few inches, but the combination of rolling and sliding contact serves to effectively break up any larger particles of ink to suitable fineness and distribute it evenly along the length of each succeeding roll. The reciprocating motion of these vibrating rollers is brought about by means of cams which are especially designed for this purpose.

Air Springs Used to Conserve Energy

On the flat bed press it is customary to install two or four connecting air springs or cushions at each end of the machine in order to afford a temporary storage of energy when the bed approaches the end of its stroke. This accumulated energy serves to aid in starting the bed in the opposite direction, thus relieving the pressure and jar on the driving mechanism during



Courtesy of Miehle Printing Press & Manufacturing Company.

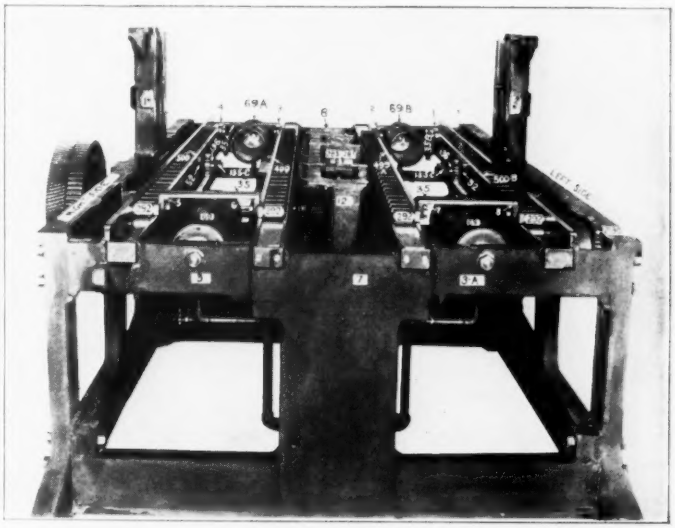
Fig. 2—Showing the side elevation of a vertical press in cut away view. Interior construction, and the relation of the driving gears are indicated in detail.

this period of stopping and starting, and reducing the power required for operation.

The benefits to be derived from air cushions can be the more readily appreciated when we consider that regardless of the speed of operation, the bed must come to an absolute stop on dead center, the change in motion taking place very rapidly.

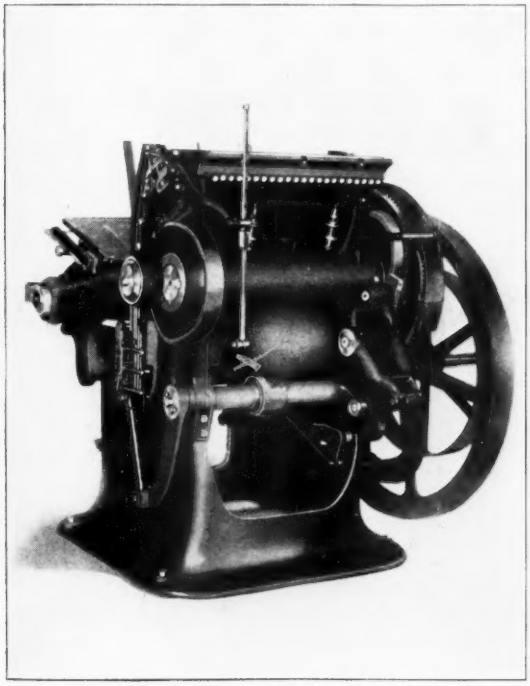
In order for an air spring to function effectively, the piston must fit snugly in the cylinder, and yet be capable of entering with perfect freedom. Leakage of air would, of course, be a detriment; therefore, it is customary to equip the end of the piston with a leather cup packing. When properly installed, and of sufficient pliability to conform to any minor undulations in the surface of the cylinder, this cup serves to trap the contained air upon entering, and to expand almost immediately due to the increasing pressure encountered.

An effective seal is thus attained and the full benefits of the compression derived. Inasmuch as this seal will be practically entirely governed by the condition and manner of setting of the leather packing, it is most important to observe the greatest of care in handling the leather. Primarily it must be properly centered on the piston, capable of readily entering the cylinder, and quite soft and pliable.



Courtesy of Miehle Printing Press & Manufacturing Company.

Fig. 4—Showing the base of a Miehle flat bed, the location of the bed motion star wheel, and also the air spring cylinders. These are indicated in the rear by 69-A and B respectively.



Courtesy of Thomson-National Press Company.

Fig. 3—Rear view of a Thomson "Colt's Armory" press, equipped for oil lubrication.

How to Protect this Seal

To attain these objectives, afford as perfect a seal as possible, and bring about a minimum of power consumption for operation, lubrication has been found to be of the greatest benefit. In other words, the leather as well as the cylinder must be properly lubricated. Lubrication of the leather involves periodic soaking or boiling in neatsfoot oil.

The walls of the cylinder, however, are best served with a medium bodied, average melting point grease. A suitable film of such a lubricant will not only reduce rubbing friction to a marked extent, but also will insure against leakage of air much in the same manner as in an air compressor.

LUBRICATION OF THE FLAT BED PRESS

The "Star Wheel"

The main driving gear or "star wheel" is probably the most important piece of mechanism in a flat press from the viewpoint of lubrication. This gear carries the entire load of the machine and is subjected to heavy duty, considerable wear, and oftentimes lack of attention due to its more or less inaccessible location beneath the type-bed.

The star wheel will receive especially severe service in cases where the air cushions are not functioning properly or where the pressure is not absolutely equalized. The abnormal jar resulting every time the press bed starts and

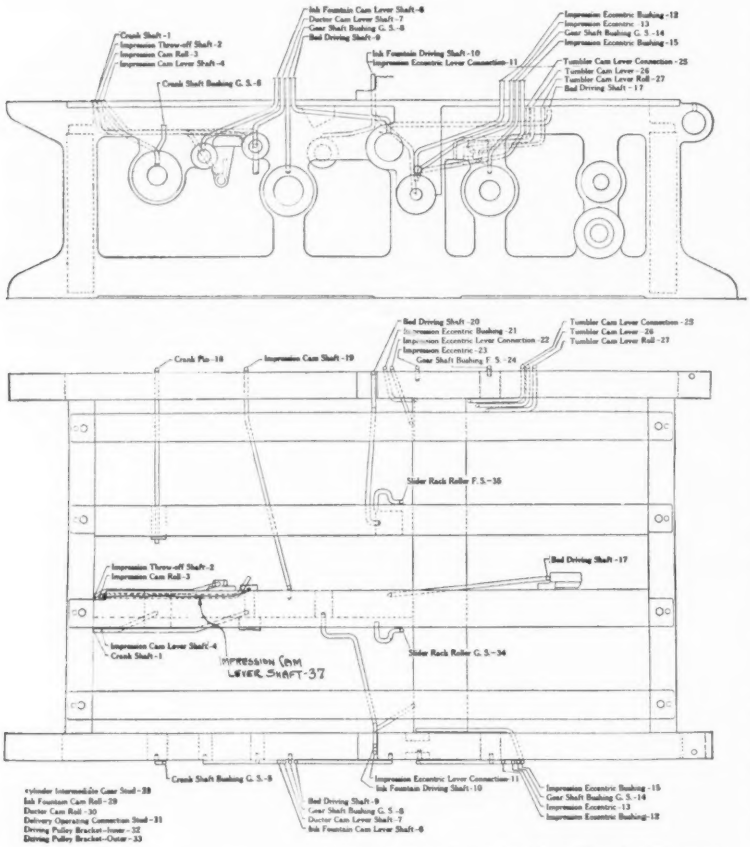
stops will naturally subject the teeth to more or less severe and uneven shock, with the result that wear will be excessive or, in extreme cases, the teeth might be stripped or chipped.

Characteristics of the Gear Lubricant

To counteract any possibility of such occurrences it is advisable to keep the teeth well coated at all times with a good adhesive, heavy-bodied lubricant, which will not only resist squeezing out but will be capable of furnishing a sufficient cushion to prevent metal-to-metal contact however severe the operating conditions. Permanence in the film of lubricant will be better insured if the relative fluidity of such a compound is sufficiently high to withstand any reduction which may be brought about by extreme operating temperatures.

Other Wearing Elements

In other respects the average flat bed press will involve the lubrication of bearings, cams, rollers, gears and chains. Where bearings are externally heated such as at the ends of ink rollers, etc., they are often fitted with reservoirs in the top bearing cap or to one side of the base. These reservoirs can be packed with waste and soaked with oil at regular intervals. Where such parts are located beneath the press or in any other more or less inaccessible position, however, suitable piping is usually run from the holes in the bearing caps to the side of the press. Either oil or grease can be used, according to the type of lubricating fitting installed.


Crank Shaft - 1
Impression Throw-off Shaft - 2
Impression Cam Roll - 3
Impression Cam Lever Shaft - 4
Crank Shaft Bushing G. S. - 6
Ink Fountain Cam Lever Shaft - 6
Ductor Cam Lever Shaft - 7
Gear Shaft Bushing G. S. - 8
Bed Driving Shaft - 9
Ink Fountain Driving Shaft - 10
Impression Eccentric Lever Connection - 11
Impression Eccentric Bushing - 12
Impression Eccentric - 13
Gear Shaft Bushing G. S. - 14
Impression Eccentric Bushing - 15
Tumbler Cam Lever Connection - 25
Tumbler Cam Lever - 26
Tumbler Cam Lever Roll - 27
Bed Driving Shaft - 17
Crank Pin - 18
Impression Cam Shaft - 19
Bed Driving Shaft - 20
Impression Eccentric Bushing - 21
Impression Eccentric Lever Connection - 22
Impression Eccentric - 23
Gear Shaft Bushing F. S. - 24
Slider Rack Roller F. S. - 35
Slider Rack Roller G. S. - 34
IMPRESSION CAM LEVER SHAFT - 37

Courtesy of American Type Founders Company.

Fig. 5—Lubrication diagram of a Kelly Press No. 2, showing the location of oil tubes in both plan and elevation.

On certain flat bed presses special attention must be given to such parts as bed motion shaft boxes, flywheel shaft boxes, cylinder and eccentric boxes. In fact, any bearing part located adjacent to the side frame or set in a close fit between the side frame jaws as are all types of cylinder boxes, requires regular and careful lubrication.

Especially on these latter parts will the lack of lubricant give rise to a roughening of the wearing surfaces, etc., with the possibility of the cylinder being unable to take its full lift. As a consequence, impairing of the register or proper correspondence of the lines, etc., on opposite sides of the printed sheets may result.

Bearing Lubricants

For bearing lubrication it is customary to use a straight mineral press oil having a viscosity of from 300 to 500 seconds Saybolt at 100 degrees Fahr., or a medium consistency grease. Such an oil can be readily handled in a sight feed or mechanical force feed oiler. The choice of grease should be made with consideration of the type of bearing and the means of lubrication. Lubricants which show any tendency to gum should be avoided at all times.

Cams and Chains

Cam surfaces and chain links are also best lubricated by an oil of the above viscosity range, although certain press builders advocate grease in some cases. It must be remembered that however carefully a press is lubricated or cleaned a certain amount of lubricant will always drain through plain bearings and find its way out along the end of the shafts to ultimately drip upon the mechanism below, or to the floor.

Due to this occurrence there will practically always be a certain amount of free lubricant in the process of dripping and cams, gears, and chains will receive their share of it. So there is usually slight chance of any such mechanisms being underlubricated, provided the bearings are properly attended to.

Miscellaneous Gears

Oil dripping, however, often develops more or less of a problem in connection with some of the gears, for certain types of gear lubricants will become materially thinned down by oil, and their effectiveness thereby reduced.

For this reason many pressmen prefer a relatively heavy grease with sufficient soap content to insure against too great a reduction in the body of the lubricating film. Others rely on the press oil to lubricate their gears, oiling the latter with the same care and regularity they observe for their bearings.

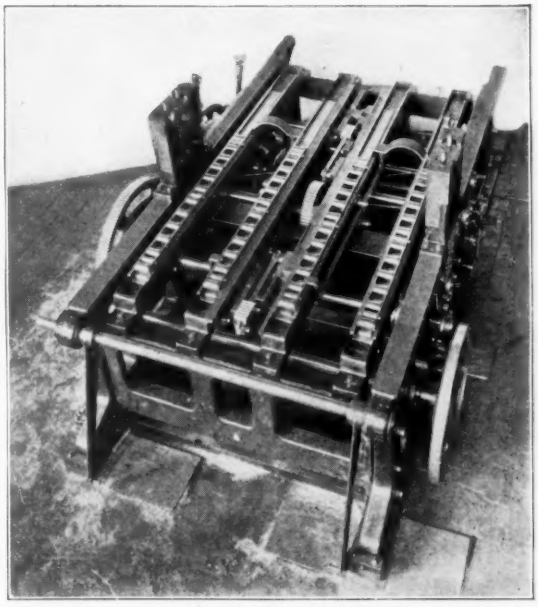
On lighter gears, oil will prove a very dependable lubricant, but the heavier roll gears will usually function with less noise, less wear and greater efficiency if a semi-solid lubricant is used.

Lubrication Procedure

Press lubrication must be attended to regularly if best results are to be obtained. The flat bed press being largely a hand lubricated machine exemplifies this fact strongly.

There is usually no lubricant reservoir of any extensive capacity installed in connection with such a press. As a result, the human element is practically the deciding factor, and the care and regularity with which the press mechanisms are lubricated will be a measure of the operating efficiency, rate of production attained and the power consumption.

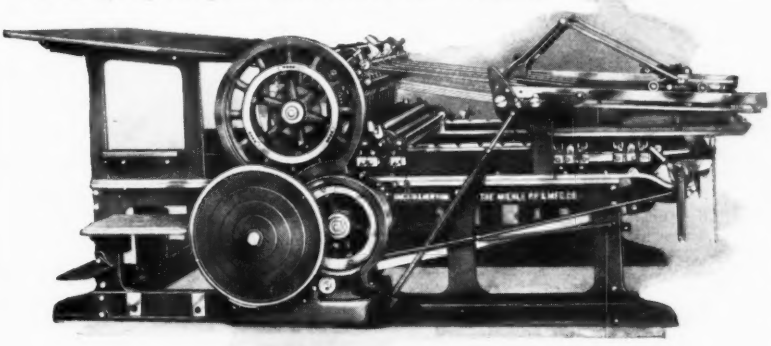
In carrying out press lubrication the essential point to keep in mind is the function of each part requiring lubrication. It is not enough to simply squirt oil miscellaneously into every oil hole in sight or sluice the gears or bearings generously. Not only will oil be wasted in such a case, but as well both machine and floor will become an oily mess to endanger the safety of the operators.



Courtesy of American Type Founders Company.

Fig. 7—Top view of a Kelly flat bed press, showing the rollers and driving gears. This press is provided for oil lubrication by means of suitable pipes leading in from the sides of the machine.

Far better is it to recognize the fact that every pair of surfaces in contact with each other possess a certain relation in their motion in respect to each other and, therefore, require a certain definite amount of lubrication at the points of contact in order to reduce solid friction as much as possible. Only by practice and observation can this theoretical oil requirement be approximately decided upon.



Courtesy of Miehle Printing Press & Manufacturing Company.

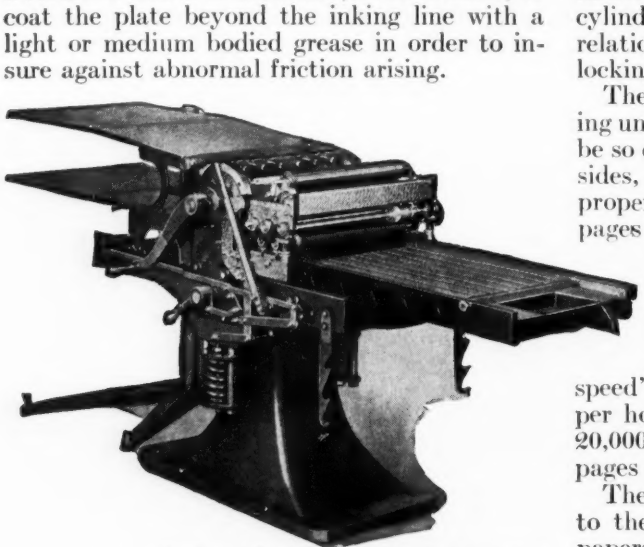
Fig. 6—Elevation of a Miehle 4-roller press, showing the assembled relation of the working elements.

Age of Press a Factor

Another point that must be taken into consideration is the age of the press. It is perfectly evident that a new press will require somewhat more oil and greater frequency in its application than one which has been in operation long enough to run all its working mechanisms into a "running fit" with each other.

Difficulty may also sometimes be encountered in press operation by bursting of ink rollers at the ends. Especially when running short forms on a flat bed press will considerable friction arise between the ends of the

rollers and the dry surface of the ink plate. As a result of this it is advisable, in such cases, to coat the plate beyond the inking line with a light or medium bodied grease in order to insure against abnormal friction arising.



Courtesy of Norma-Hoffmann Bearings Corporation.

Fig. 8—Showing a Hacker Hand Press. At the points where pressure is heaviest, and where absolute accuracy and smoothness are essential, roller bearings are installed on this press.

The life of rollers can be materially lengthened by strict adherence to this rule and maximum production with minimum power consumption assured.

Starting-Up Procedure

After lubricating such a press, especially in the morning, or before a long run, it is advisable to turn it over by hand a few times before turning on the power to see that the proper "feel" at the wheel is present.

A competent press operator can develop a sense of judgment in regard to this "feel" which is of inestimable value in checking up on lubrication. In fact, quite as essential as a knowledge of all parts requiring lubrication is the ability to judge whether these parts are functioning with a minimum of friction.

At frequent intervals, particularly if the press is used intermittently, it will be advisable to rinse bearings, oil holes and waste pad reservoirs out with kerosene, especially if dirt or dust is prevalent in the pressroom, or when certain grades of paper are used which develop "fluff."

THE WEB PRESS

This press receives its name by virtue of the fact that the paper is fed to it in a continuous sheet or web from a roll. It is primarily used in the printing of newspaper and magazine material.

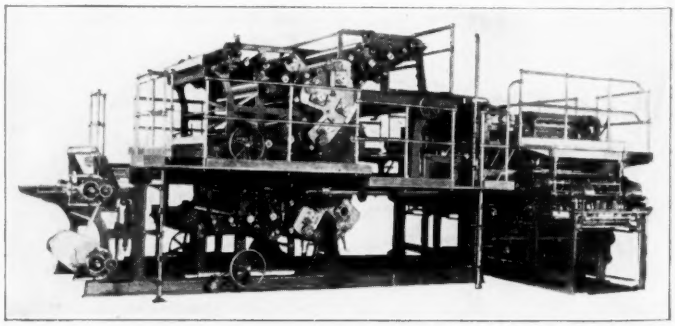
Web presses are usually rotary cylinder machines wherein the plates of typographical matter are curved to the diameter of the type cylinders and retained thereupon in proper relation to each other by means of a suitable locking device.

The modern web press is a complete producing unit in itself, by virtue of the fact that it can be so constructed as to print the paper on both sides, cut the printed web into pages along the proper margins, collect the necessary number of pages in proper numerical order into insets of desired size, fold the completed sets and deliver them ready for distribution by the newsdealers. Speed of output can be realized by noting the production of one of the latest types of "Superspeed" presses, which range from 80,000 papers per hour of a maximum of 16 pages inset, to 20,000 papers per hour of a maximum of 64 pages collected.

The production of such a press when applied to the printing of magazine insets for newspapers is also of interest. Typical examples of such work are the comic sheets and colored supplements in our Sunday papers. One of the largest presses of its kind in the world is capable of printing in from one to four colors and the maximum production ranges from 144,000 8-page 2-color insets to 36,000 16-page, 4-color insets per hour. Varying combinations are also possible in between, depending upon the number of pages and color arrangements involved. The custom in many houses publishing magazine insets, etc., is to print, cut and deliver insets consisting of 16 pages of text, or 4 to 8 pages of advertising matter, usually in one color only.

Details of Operation

The operation of a modern high speed octuple newspaper press will be of decided interest, and of aid later in appreciating the important part that lubrication plays in the maintenance of high speeds and intensive production, viz.:



Courtesy of C. B. Cottrell & Sons Co.

Fig. 9—Side view of a Cottrell Rotary Magazine Press.

The general construction of such a press

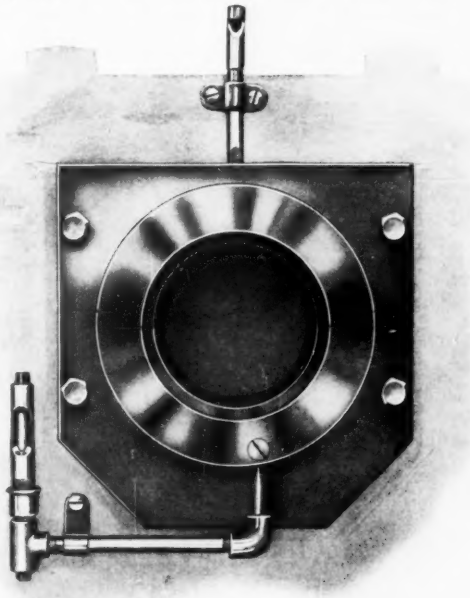
involves four distinct printing sections or so-called units, which are located in pairs at each end of the machine. Between these pairs of units are the folding devices. Each unit comprises two plate cylinders, upon which, as previously stated, the curved stereotype plates are securely locked in place; and two impression cylinders which serve to press the paper against the plate cylinders, their surfaces being covered with blankets made especially for obtaining the proper impression.

Each plate cylinder carries eight stereotype plates, each the size of a full newspaper page, so the entire press has a capacity of sixty-four plates or pages of newsprint when "fully dressed" or ready for maximum production.

The Inking Mechanism

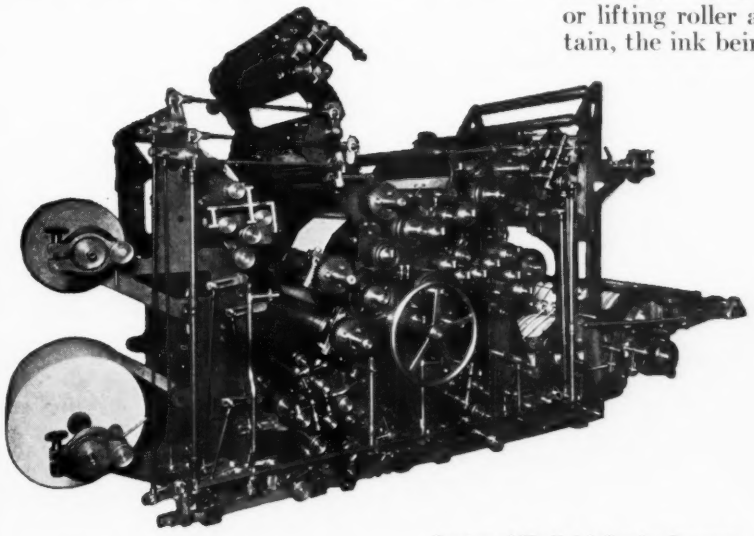
Ink distribution is an important feature in web press operation. According to the type of press this may involve either a set of individual ink rollers for each unit, which take their ink supply from an adjacent fountain, or a patented pump system of ink distribution whereby the ink is pumped from a supply tank in individual streams (one for each column of print) to the ink distributing cylinders. This latter device eliminates the ink fountain with its accessory lifting rollers. In detail such a pump is usually composed of thirty-two small pumps, much on the order of a mechanical force feed lubricator. These pumps work in unison, being directly connected to the distributing cylinder which is in turn driven from the plate cylinder it supplies. Thus the amount of ink supplied is always in direct proportion to the speed of the press. Each individual pump is capable of independent adjustment.

Where an ink fountain is involved each unit is equipped with its individual set of accessory ink rollers. In such an arrangement the ductor or lifting roller alternately dips into the fountain, the ink being subsequently transferred to the distributor rollers, which are arranged to travel from side to side across the distributing cylinder with relation to each other, as on a flat bed press. Even distribution and complete breaking up of the ink is thus insured. This vibrating motion is attained by means of suitable cam mechanisms.



Courtesy of R. Hoe & Company.

Fig. 11—Self-oiling box as used on certain types of high-speed rotary web presses. This illustration shows the box ready to receive the cylinder bearing.



Courtesy of The Fafnir Bearing Company.

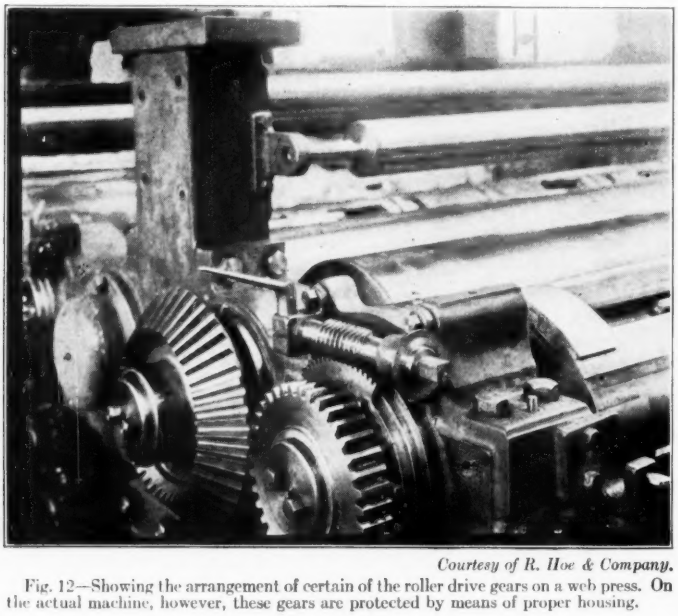
Fig. 10—Ball bearings have also been adapted to the Progress rotary printing press. The installation of anti-friction bearings is an assurance of a more positive operation where the bearings are designed to retain lubricant for a considerable length of time.

Handling of the Paper

The webs of paper which come in rolls approximately six feet long and about thirty-two inches in diameter are placed either below each press section or at the end of the press, according to the design. In operation, the paper passes in a continuous sheet between the plate and impression cylinders, where it is printed first on one side and then on the other.

From the press sections the webs or sheets

then pass over rollers to the folding mechanism and after being slit along the center, travel over a "V"-shaped former, where the first longitudinal fold is brought about. These folded sheets are then cut to page size by a revolving knife cylinder, after which they receive their second or half-page fold.



Courtesy of R. Hoe & Company.

Fig. 12—Showing the arrangement of certain of the roller drive gears on a web press. On the actual machine, however, these gears are protected by means of proper housing.

The final step is their delivery onto an endless belt arrangement ready for distribution to the readers. The novel feature of this delivery is the device which pushes out every fiftieth paper a little in advance of the others to simplify counting the products.

In general construction the web press involves much the same mechanical details, such as bearings, gearing, and cam devices, as the flat bed press, with the exception that there is no reciprocating motion involved. Therefore, air cushions, bed rollers and tracks are eliminated. The magazine electrotype web press embodies practically the same principles of operation as the newspaper press.

WEB PRESS LUBRICATION

The above description of the functions and operating principles of the modern web press brings out the importance of proper lubrication. Most press builders have appreciated this fact and today they equip all important bearings of their machines with self-oiling or anti-friction bearings, and guard all gears as effectively as possible not only for the safety of the operators, but to improve the retention of the gear lubricant as well.

The web press involves bearings, gears and cams. The intricacies of all of these mechanisms with respect to each other demands the most careful mechanical attention in every detail. A stripped gear, a scored bearing, or a worn cam anywhere on the press might easily cause partial or complete shut-down, for such parts can not usually be renewed or repaired during operation.

Anti-Friction Bearings Favored

Ball bearings are frequently installed on all cylinders, pipe and compensating rollers, or the rollers over which the web passes in going through the folders, it being essential on such equipment to eliminate the possibility of smudging as much as possible.

Ball bearings, where oil tight, can be adequately served by a light bodied straight mineral oil free from acid or alkali. Usually a viscosity in the neighborhood of 100 to 300 seconds Saybolt is advisable. Where it is not possible to use oil, medium consistency grease will be found satisfactory and capable of being retained in the bearing.

Heavy Bearing Construction

Other heavier bearings, such as those carrying the main, intermediate and folder driving shafts, are in many machines nowadays built extra heavy and equipped with self-oiling pillow blocks below the bed plates. Certain presses also have their plate and impression cylinders carried in similar bearings, being so designed that the bearings can be readily removed from the cylinder shafts for inspection without disturbing the cylinders.

Where self-oiling bearings are concerned there is but little possibility for wasted oil, and with the reservoir once charged, effective lubrication should be assured for a period of several weeks. For such service a straight mineral lubricating oil having a viscosity of from 300 to 500 seconds Saybolt at 100 degrees Fahr. will be suitable.

Plain and open bearings are in use on practically all other shafting. In fact, in certain presses they are installed throughout the machine. For such service the press oil recommended above for self-oiling bearings will be quite suitable.

As in the flat bed press there will always be considerable dripping of lubricating oils from bearings of this character, however carefully they may be lubricated. Oftentimes adjacent

cams and gears will receive the benefit of the greater part of such free oil.

Gear Lubrication a Problem

Gear lubrication will, therefore, become more or less of a problem, just as in the flat bed press, due to the tendency such oils have of washing off the more usual gear compounds.

Guarding the gears is advantageous to a certain extent, but rarely protects the gear teeth completely.

Where light duty is involved, it is quite naturally satisfactory to let this dripped oil serve as the lubricant, adding a little extra to the teeth now and then from an oil can. But heavier gears require a viscous heavy bodied gear lubricant. Many of such compounds are readily reduced by oil and rendered ineffective in a short time. Even certain soap thickened products, such as greases, suffer in a similar manner.

Therefore, the problem of press gear lubrication may be said to involve a three-fold consideration, wherein the grade of lubricant must be selected more or less subordinately to the mechanical construction of the press bearings and the installation of adequate gear guards. Of course, on all gearing, wherever possible, a straight mineral, heavy bodied gear compound will prove the better lubricant by virtue of its economy and adhesive characteristics and its ability to resist squeezing out from between the teeth under abnormal pressures.

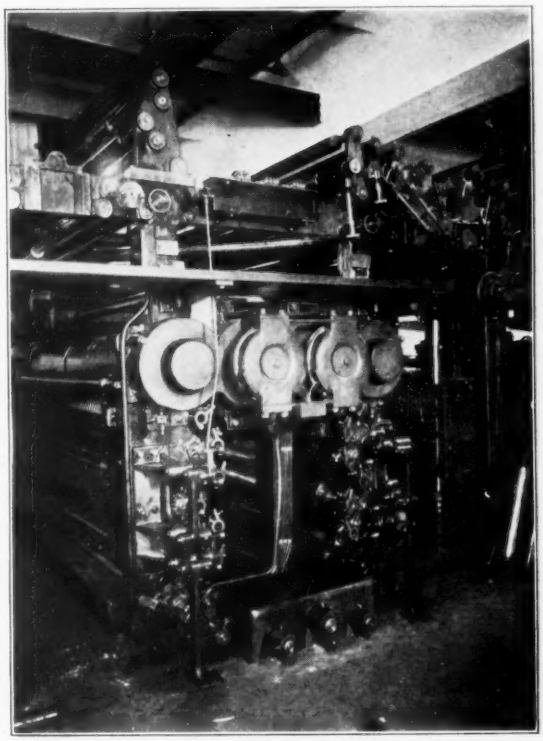
THE TREND TOWARDS AUTOMATIC LUBRICATION

A marked development in the printing industry, especially in connection with newer types of presses, has taken place in the adoption of automatic means of lubrication. This has involved both oiling and greasing devices. Of the former, the mechanical force feed oiler, the centralized oiling system and the wick oiler have been perhaps the most extensively tried out. For the handling of heavier products, the spring type grease lubricator has proven adaptable.

The Mechanical Force Feed Lubricator

The mechanical force feed oiler involves one-time lubrication in very much the same manner as an oil cup or drip feed oiler. It, however, delivers more nearly the requisite supply of oil under a certain amount of pressure to meet the bearing requirements. If due care is observed when installing and the oil feed is properly adjusted, such lubricators are dependable and decidedly economical.

There is a further advantage in that, by virtue of the fact that such devices can be readily driven through a connection from the press itself, they can be made to function only when this latter is in operation and then at a



Courtesy of Madison-Kipp Corporation.

Fig. 13—Illustrating a Duplex press equipped with a ratchet driven force-feed lubricator. This device is shown at the top of the machine; the oil pipes to the respective roller bearings can also be traced by looking just below the lubricator.

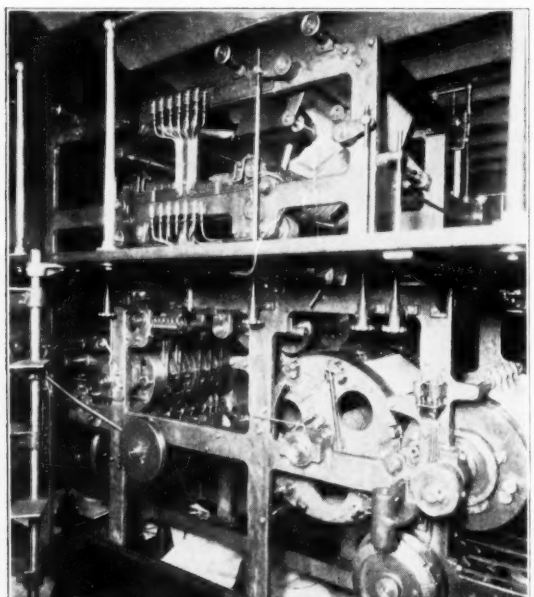
proportional speed. In other words, the higher the speed of operation the more oil will be delivered. The pumping capacity and rate of oil flow is, therefore, variable. As a result, such a lubricator will automatically start or stop with the machine.

It is practicable to drive the pumps of such a lubricator by direct connection from any external moving part. This can be brought about by a link mechanism, through belt connection or by means of an eccentric attached to some rotating element.

There is more or less of a limitation, however, involved in the usage of a mechanical force feed oiler, in that the capacity is oftentimes comparatively small commensurate with the machine requirements. As a result, such a device must be refilled with oil at frequent intervals. On the other hand, this will depend upon the extent of operation, the number of oil feeds and the rate of delivery. This latter must be worked out in actual practice according to the number of parts to be lubricated and the nature and degree of refinement of the oil being used.

Nature of Construction

The typical mechanical force feed oiler consists of a bowl or reservoir of varying capacity, ranging normally from one pint to two gallons.



Courtesy of R. Hoe & Company.

Fig. 14—In this illustration the manner in which sight-feed oilers can be installed at the side of the machine and pipes run from each lubricator is clearly indicated. It is always advisable to provide for external lubrication on any press, in order to avoid having to shut down unnecessarily when interior parts are to be lubricated.

Within this reservoir, or attached thereto, is the pumping element or block. To this latter is attached the operating ratchet, or other driving connection.

The design of pump employed will depend upon the type of lubricator. In general, it will involve a piston or plunger. According to the nature of the service, quite a number of such pumping units can be embodied in the one lubricator.

Actual operation of the pumping element is brought about by an eccentric or cam located usually within the reservoir. It receives its motion through the exterior operating mechanism, such as the ratchet.

The design can be arranged so that each pumping unit will operate independently, and capable of individual regulation. In order that the extent of lubrication or rate of pumping can be observed, oil is delivered from the pump unit through a suitable gauge glass or sight feed device. The purpose of locating this latter in the discharge line is, of course, to enable observation of oil flow, after the lubricator has functioned.

Centralized Pressure Lubrication

The operating principles of a typical centralized pressure oiling system will also be of interest. As a general rule, such a system of automatic lubrication functions by virtue of a central control, all wearing parts so served being flushed and supplied automatically with oil from a central tank or reservoir.

As a general rule, this latter is located adjacent to the machine to be lubricated, and within ready reach of the operator. It is equipped with a suitable plunger which operates the pump. As a result, lubrication of all parts connected thereto becomes but a matter of turning a hand wheel, pulling a plunger or pressing a button. The frequency with which this should be carried out will depend upon the speed of the press, the size of the bearings and the length of time it is operated. In such a means of lubrication, the amount of oil fed is restricted to as nearly as possible the theoretical lubricating requirements of the respective bearings. As a result, it may be classified as a "fresh oil" system.

The fact that certain bearings will vary from others in regard to their oil requirements renders it necessary to provide for some arrangement of regulation or control of oil flow. Practically, this amounts to a metering of the oil in terms of drops. It can be brought about either by proper individual construction of the drip plugs, which on such equipment are also known as control outlets; by use of a control device located at the base of the pump; or by the installation of suitable adjusting manifolds at salient points in the system.

Properly installed, such systems are claimed to be relatively fool-proof, exceedingly simple to operate, and an insurance that clean oil will be delivered to the respective bearings. To further insure this, certain central oil reservoirs are equipped with suitable filtering media, such as a felt pad, which is claimed to effectively remove any foreign matter that may have entered the oil in the course of storage or handling prior to usage.

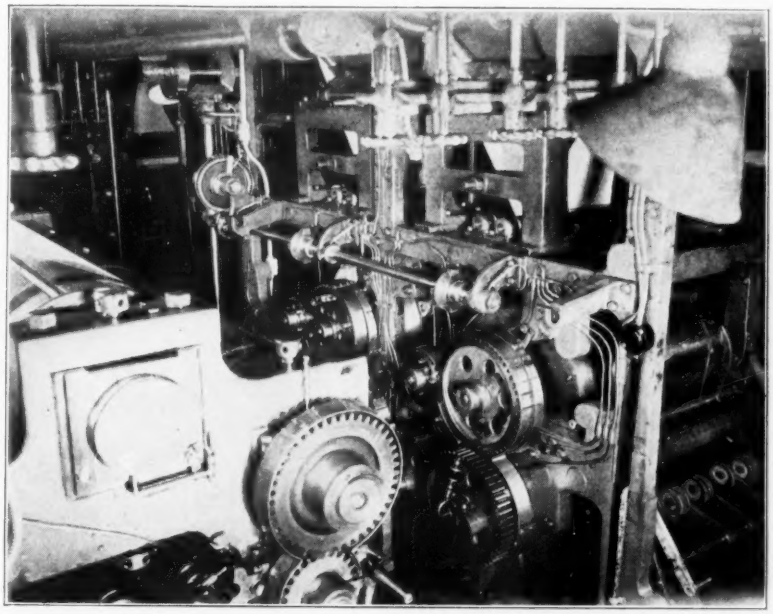
The Wick Feed Oiler

In contrast to the above mentioned means of lubrication, which provide for collective oiling from a central point of control, the wick feed oiler as applied to the printing press is an individual means of lubrication. In other words, one or more such oilers must be used to serve each bearing, although they can all be gathered together at one point of location on the side of the press, each being connected to its respective bearing or other wearing element by means of suitable tubing.

The wick feed oiler is entirely automatic in that it will continue to feed oil just as long as

there is any contained in the oil cup. On the other hand, where the press is to be intermittently shut down, this may develop into waste, for oil will be fed whether the machine is running or not. This, however, is overcome by installation of a suitable shut-off cock in the oil line. It is, therefore, only a matter of opening each cock when the machine is to be started and shutting same when a run is finished. The only other attention involved is refilling with oil.

Wick feed oilers are adjustable in their rate of oil flow according to the number of strands contained in the wick. These can be readily varied according to the actual bearing requirements.



Courtesy of Lubrication Devices Incorporated.

Fig. 15—Showing part of a Hoe Press equipped with means for centralized lubrication by use of the Farval system. The respective oil pipes and connections can be easily traced.

Pressure Grease Lubrication

The spring type of grease lubricator has proven to be adaptable for press bearing lubrication wherever interior parts are to be served automatically and where it is desired to use a heavier lubricant than oil. The typical spring type of lubricator involves a combination of the pressure grease gun plus the spring type cup. As a general rule, by using a spring of particular tension in connection with a discharge orifice of suitable size flow of grease therefrom can be very accurately controlled. Furthermore, it can be noted by observation of the indicator with which such lubricators are usually equipped.

Filling of such a cup is a simple and cleanly matter. It merely amounts to attaching the pressure gun to the fitting located in the base of the cup. There is no necessity for removal of the cover, as may be true with those cups which are more strictly of the hand pressure type. In consequence, there is more positive assurance that the grease charge will not become contaminated through possible entry of dust or dirt.

The next step is to shoot grease into the cup until the indicator rises to its full height to show that the cup has been completely filled.

The initial pressure for such filling may be obtained by use of compressed air, electric power, or simply hand or foot power, according to the type of gun and the pressure desired. The former develop considerably higher pressures than the latter. Of course, where a relatively simple hand pressure grease gun is used, the impression may be gained that this should be classified with the hand pressure or screw-down type of cup. We must, however, remember that hand pressure as applied to a grease gun does not react directly on the bearing; it must first be converted to mechanical energy by doing work in compressing the spring in the grease cup. From this point on lubrication is automatically maintained by the mechanical action of the spring upon the adjacent plunger which bears upon the grease charge to force it through the bearing.

THE LUBRICATING ENGINEER

In view of the fact that the average purchasing executive will be comparatively unfamiliar with the operating conditions in his plant, and the duty which will be required of lubricants, he should always take the lubricating engineer into consultation. In fact, purchase of lubricants should be the subject of conference wherever there may be operating problems or intricate press room machinery involved.

The lubricating engineer should be a specialist in the selection, handling and application of lubricants. He should have an intimate knowledge of the principles of refining and compounding of lubricants for specific purposes, and complete familiarity with systems and means of lubrication.

While it is usually possible to call in such a specialist from any reputable manufacturer of lubricants, certain industrial concerns will pre-

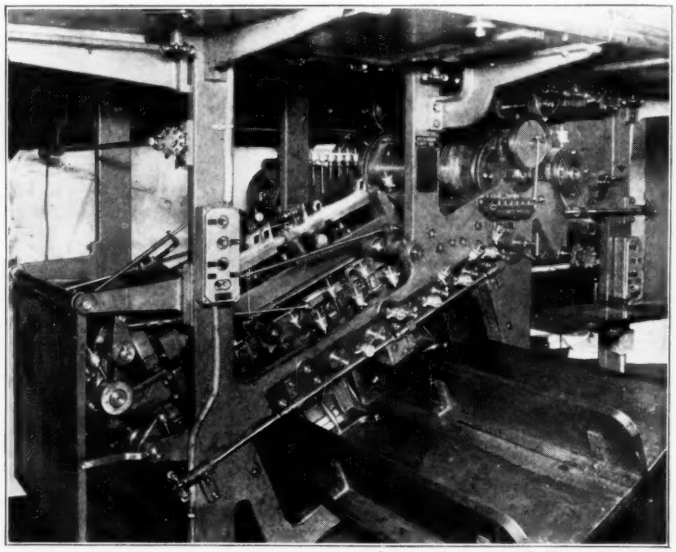
fer to retain their own talent in this regard, or enlist the advice of a consultant.

Duties of the Plant Lubricating Engineer

As a general rule the plant lubricating engineer is a decided asset wherever a considerable volume of pressroom machinery is involved, and where impaired lubrication in any unit might seriously disrupt a production schedule.

In such concerns the plant lubricating engineer should have direct supervision of the storage facilities and the means of application of all lubricants. He should prepare oiling schedules, dictate periods of flushing and cleaning of lubricating systems, instruct operators as to the advantages to be derived from careful lubrication of their presses, and co-operate with the chief engineer and press foreman in the installation of new equipment or maintenance of existing units, wherever the matter of friction reduction may be involved.

An added advantage is that such an authority as a member of plant personnel can check up on the specifications of any lubricant which may be offered to the purchasing department, or he can prepare his own based on test data which he has developed according to the operating conditions involved.



Courtesy of R. Hoe & Company.

Fig. 16—The spring pressure grease cup of the Gunfil type is also adapted to press-bearing lubrication, as shown in the above illustration of a rotary web press. As stated in the accompanying article, each lubricator is filled at periodic intervals by means of a pressure grease gun.

Lubricating Engineering Service

In many pressrooms, however, the amount of machinery involved will not warrant the employment of such a specialist, or perhaps whoever this work may be detailed to will not have the requisite education or experience in matters of mechanical engineering and lubrication.

For such concerns, lubricating engineering service as offered by the manufacturer of lubricants will be a decided asset.

Of course, it is absolutely essential that such service be backed by a reputable company. To seek advice from any who have not due regard for the title of "Lubricating Engineer" might be frequently hazardous in that there would be no assurance that their lubrication recommendations could be depended upon.

Lubrication engineering service of repute, however, is one of the greatest assets available to the operator of printing machinery. It affords an especially economical way of availing oneself of expert technical advice in regard to solution of problems of lubrication and the determination of lubricants capable of maintaining operation in the most efficient manner.

Furthermore, the lubricating engineer who represents a reputable manufacturer of lubricants will as a rule be far more conversant with the many variables that must be considered, than he who is in the employ of any specific industrial concern. This is quite natural, for the latter has far less opportunity to study and familiarize himself with lubrication as applied to industry as a whole.

The former, however, is so broadly trained by actual experience that his advice should never be overlooked. He can show the dollars to be saved in year-round power consumption and machine maintenance costs, where otherwise the pennies in cost per gallon of lubricating oils might be the sole consideration of the purchase.

Printed in U. S. A. by
EDGAR C. RUWE CO., INC.
72 Washington St., N. Y. C.